plosion or series of explosions that wrecked the geyser field.

That here the result of geyser action has been powdered sand grains rather than geyserite, as at the Yellowstone, would be due to the different kinds of rock at the two places.

Underlying Yellowstone Park are compact, igneous rocks. They would be gradually dissolved by hot alkaline water with formation of geyserite.

At Coon Butte the underlying rocks are loosely coherent sandstones whose grains would be carried up bodily, and solvent action would be relatively less.

Other things being equal, the time required to carry up the sand grains and fragments at Coon Butte would be much less than that required to dissolve an equal amount of rock at the Yellowstone Park and to deposit it in the form of geyserite.

John M. Davison

Pittsford, N. Y.,
August 23, 1910

Black Leg or Phoma Wilt of Cabbage: A New Trouble to the United States Caused by Phoma Oleracea Sacc.

Within the past few years there has appeared in the cabbage districts of Clyde and Fremont, Sandusky Co., Ohio, a cabbage and cauliflower disease apparently new in the United States. The disease has been under the observation of the writer since June of the present season. Field symptoms together with the determination of the causal fungus show the disease to be identical with that known in Holland as "Fallsucht" (drop disease or falling sickness). J. Ritzema Bos, in *Zeitschrift fur Pflanzenkrankheiten,* Band 16, pp. 257–276, 1906, has fully described this disease and states the trouble is due to the fungus *Phoma oleracea* Sacc. He further describes a storage disease of cabbage known as "Krebsstrunke" (stem cancer) brought about by the same organism.

What appear to be similar diseases to the above have been noted by Prillieux[1] to occur in the forage cabbage districts of the province of Vendée, in western France, and by D. McAlpine[2] in the cabbage and cauliflower districts of South Australia. Both of these writers assign *Phoma Brassicæ* Thüm. as the causal agent.

The diseases as described by Prillieux and McAlpine are quite similar to that described in Holland and to that found in Ohio. The former calls the trouble "Pourriture des pieds de Chou," that is, "foot rot of cabbage," and the latter designates the disease "black leg or foot rot of cabbage and cauliflower."

According to Bos (see citation above) and Quanjer[3] there is reason to believe that the organism assigned by Prillieux as the cause of the disease, is identical with *Phoma oleracea* Sacc.

The disease is quite important in each of the countries noted. In South Australia, according to McAlpine, it "is perhaps the most serious trouble with which the grower has to contend." He does not mention the presence of black rot or the *Fusarium* wilt.

Symptoms.—The work of the disease is early to be observed in the infected seed beds, being often conspicuous one or two weeks prior to transplanting. The preliminary symptom is that of white, slightly sunken, elongated oval areas on the stem usually below the point of leaf attachment. Occasionally the disease spots occur on the leaves. There appear early in these lesions small, black pycnidia equally, though somewhat sparingly, distributed over the affected areas. Each pycnidium contains myriads of spores which are evidently the source of a rapid dissemination of the disease at the time of transplanting.

In the early stages of the disease the fungus may be plated out in pure culture as the sole occupant of the lesion. Later the lesion breaks and bacterial decay sets in. In the

[1] "Maladies des Plantes Agricoles," Vol. II., p. 295, 1897.

[2] "Fungus Diseases of Cabbage and Cauliflower in Victoria, and their Treatment," Dept. of Agr., Victoria, January, 1901.

[3] *Zeitschrift für Pflanzenkrankheiten,* Band 17, 1907, pp. 259–267.

preliminary attack of seedlings, no leaf change takes place. Finally, however, as the lesions become confluent and a collar rot is being effected the margins of the outer leaves take on a reddish tinge; this latter symptom is usually followed by wilt and a quick collapse.

It is in half to two thirds grown plants that the disease is seen at its worst. Here it causes a rapid destruction of the cambium at a level with the ground, which extends quickly above and below. The fungus penetrates the xylem, followed by bacterial decay. The severely affected plants show a metallic bluish-red color on the margins of the outer leaves, with also some evidence of wilt.

The rot lesions extend deeply into the stem. As soon as a collar rot is effected the plant collapses with a sudden wilt. Soon the stem becomes so badly rotted that the wind often upsets the plant by breaking its connection with the root, and the plant blows away.

Even in the advanced stages of the disease the fruiting bodies of the parasite may be found at the margins of the lesions.

The losses in the Clyde and Fremont districts have been excessive. In the vicinity of Clyde it has been working in conjunction with the *Fusarium* wilt, the two diseases having almost driven the cabbage growers out of the business. Several cases were noted by growers where their fields last year suffered almost total loss from this disease. In a field at Fremont put to cabbage both last year and this, the amount of *Phoma* infected plants was fully 65 per cent. on date of August 4, this season.

The progress of cabbage diseases at Fremont, which is a comparatively new cabbage district, shows the *Phoma* wilt is much more aggressive at present than the *Fusarium* wilt, though the latter has appeared in a very limited amount in two fields.

During the season the disease has been reported with specimens from several other localities in the state. From a statement made by F. L. Washburn, state entomologist, in his 1906 report (p. 18) to the governor of Minnesota, it is quite probable that the disease appears there. He notes in reviewing the club root of cabbage, "Many market gardeners confound the work of the maggot with diseases which affect the root and have no connection whatever with the maggot. This is noticeably true of a form of rot which sometimes affects the roots, causing wilting and death of the plant."

That cabbage maggots, the cabbage curculio and wireworms are active in furthering the disease, is noted by Bos and Quanjer (see both citations above). The latter has shown that *Phoma oleracea* Sacc., which heretofore has been regarded as a saprophyte, is directly pathogenic on fully grown and harvested cabbage heads, but somewhat weakly parasitic on germinating plantlets and rapidly growing seedlings.

The writer has observed that seedlings of the varieties All Season and Market Garden are early and quite susceptible to this fungus.

A preliminary bulletin is being prepared calling attention to the nature of the disease, and to practises which are useful in avoiding both the *Phoma* wilt and the *Fusarium* wilt. The investigations on these diseases will be continued.

THOS. F. MANNS
DEPARTMENT OF BOTANY,
AGRICULTURAL EXPERIMENT STATION,
WOOSTER, OHIO,
September 8, 1910

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and fiftieth regular meeting of the society was held at Columbia University on Saturday, October 29, extending through the usual morning and afternoon sessions. Forty-three members were present. Ex-president W. F. Osgood ocupied the chair at the morning session, Ex-president H. S. White and Professor Edward Kasner at the afternoon session. The following new members were elected: Dr. G. A. Campbell, American Telephone and Telegraph Company; Mrs. E. B. Davis, Nautical Almanac Office; Professor C. W. Emmons, Simpson College; Professor H. C. Feemster, York College; Mr. R. R. Hitchcock, University of North Dakota; Mr. W. J. Montgomery, University of Michigan; Professor